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October 21, 1997

William F. Caton, Secretary  
Federal Communications Commission  
1919 M Street, NW  
Washington, D.C. 20554

RECEIVED  
OCT 21 1997  
FEDERAL COMMUNICATIONS COMMISSION  
OFFICE OF THE SECRETARY

Re: Ex Parte Submission  
Federal-State Joint Board on Universal Service  
CC Docket No. 96-45 /  
Forward-Looking Mechanism for High Cost Support for Non-Rural LECs  
CC Docket No. 97-160

Dear Mr. Caton:

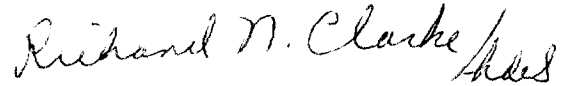
At the Commission staff's request, on October 20, 1997, the Hatfield Model Sponsors (HMS) met with Brian Clopton, Chuck Keller, Mark Kennet, Bob Loube, Bill Sharkey and Natalie Wales of the Common Carrier Bureau. At this meeting, the HMS were represented by Rich Clarke of AT&T, Chris Frentrup of MCI, and Chris Antis and Kevin Landis of PNR and Associates. The purpose of this meeting was to provide more detail on the process used by PNR to determine customer clusters based on geocoded customer locations.

At this meeting, the HMS reviewed general clustering algorithms, both those used by PNR and those rejected by PNR for their lack of suitability for use in engineering telephone distribution plant. Greater detail was provided on the network engineering specifications that were embedded into the "nearest neighbor" clustering methodology that was selected for use by PNR; and an example of the operation of this methodology was provided. We also went through the C++ code implementing the clustering process (filed with the Commission on September 30, 1997) and described heuristically the steps of the clustering algorithm that were being performed by various sections of the code. Also attached to this filing is a list of all of the data sources that are to be used in the Hatfield Model, Release 5.0.

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Two copies of this Notice are being submitted to the Secretary of the FCC in accordance with Section 1.1206(a)(1) of the Commission's rules. Because of the late hour of this meeting, this notice is being filed the following business day.

Sincerely,



Richard N. Clarke

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Attachments

CC: FCC Staff - Bryan Clopton, Chuck Keller, Bob Loube, Mark Kennet, Bill Sharkey, Natalie Wales, Sheryl Todd

State Staff –

Charlie Bolle - South Dakota PUC

Deonne Brunning – Nebraska PSC

Ann Dean - Maryland PSC

David Dowds - Florida PSC

Bridget Duff - Florida PSC

Lori Kenyon - Alaska PUC

Sandra Makeef - Iowa Utilities Board

Phillip McClelland – Pennsylvania Office of Consumer Counsel

Anthony Myers - Maryland PSC

Thor Nelson – Colorado Office of Consumer Counsel

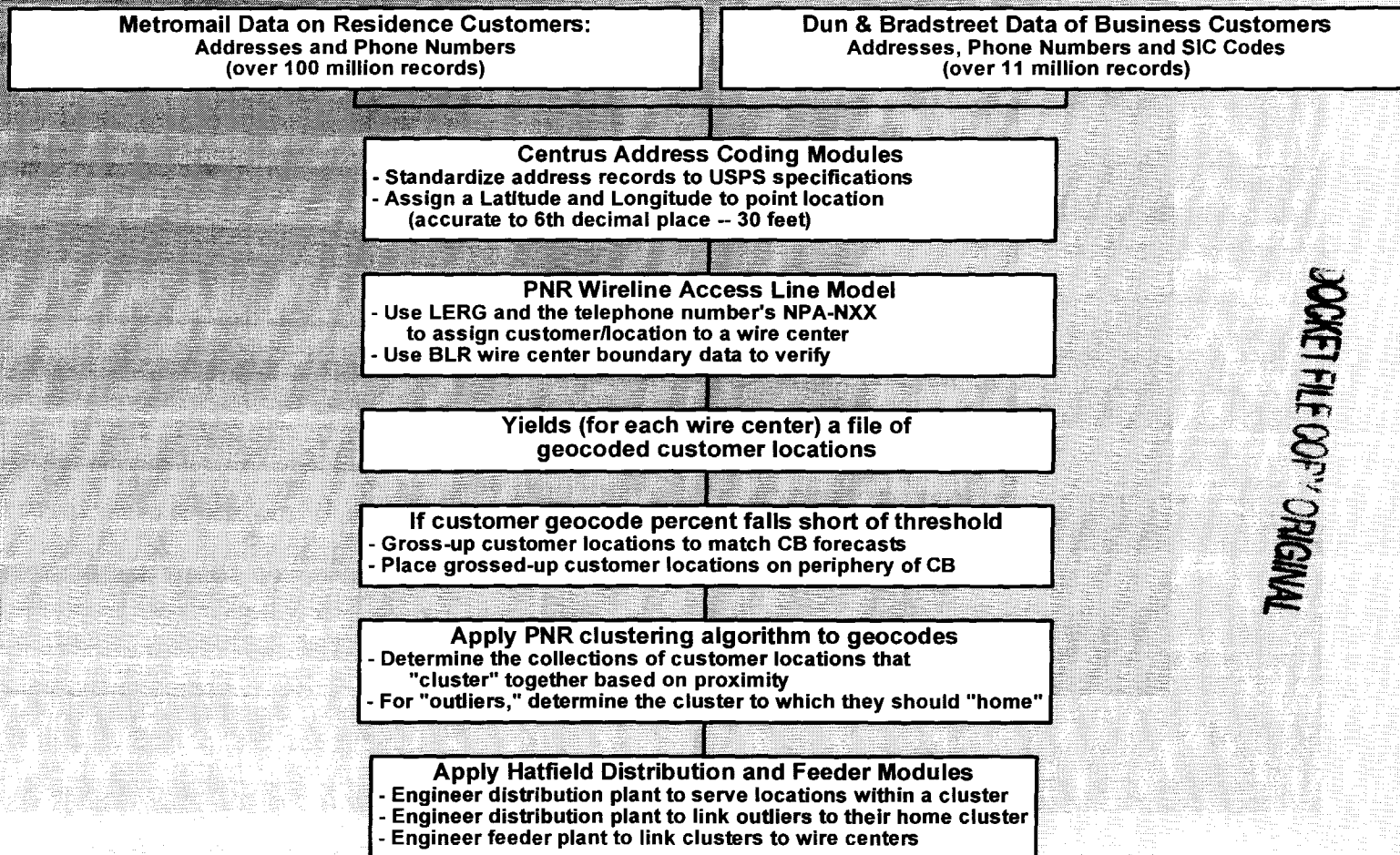
Barry Payne - Indiana Office of Consumer Counsel

Brian Roberts - California PUC

Kevin Schwenzfeier - New York DPS

Tiane Sommer - Georgia PSC

# Customer Location Process



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# Clustering

- Other clustering methods tried -- with varying levels of success:
  - K-means
  - Hierarchical clustering
  - Nearest neighbor
  - Edge detection / Pattern recognition
  - Simulated annealing
- Clustering for telephone distribution areas needed to be RULE BASED

# Clustering

- Thus, clustering needed to be developed specifically
- Somewhat based on the nearest neighbor methodology
- Clustering rules here can be applied at the clustering level, NOT afterward

# Clustering

- Envision clustering manually:
  - Start at Point A
  - Create a circle from point A with a radius of 100 feet
  - All the points within this circle or touching its circumference are considered to be part of the cluster
  - Do this for all points within this first cluster
  - Go to next unclustered point

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# Clustering

- Manual representation (con't)
  - Now continue by selecting Point A again and draw a circle with a radius of 200 feet.
  - Continue with the other points in that cluster
- This process can continue until one of the rules are violated or until you reach another, predetermined limit.

# Clustering - Rules and Parameters

- RULES:
  - 18,000 feet rectilinear distance from cluster centroid
  - 1800 line maximum in the cluster
- PARAMETERS:
  - Maximum distance between points
  - Minimum number of points to create a cluster



## DATA SOURCES USED IN THE HATFIELD MODEL v5.0

No.	Data Source	Usage in HM 5.0
1	Metromail data on addresses and telephone number (NPA-NXXs) of residence customers	Used by PNR to develop counts of residence lines by cluster/CB/CBG. Addresses used to geocode residence customer locations.
2	Dun & Bradstreet data on business firms, SIC codes, employee counts, and addresses	Used by PNR to develop counts of business lines by cluster/CB/CBG. Addresses used to geocode business customer locations.
3	U.S. Bureau of the Census - 1990 Census data by CB - 1995 Census update	Provides data on geographic areas, households and housing units, as well as demographic (age/income) information used by PNR to estimate residence primary and second line penetration
4	Claritas demographic elaborations to Census data, 1996	Used to project Census data forward to 1996 levels by CB. Provides household targets for Metromail geocode process.
5	Business Location Research (BLR) data on wire center boundaries	Used to determine geographic boundaries of wire center service areas
6	MapInfo software	Relates street addresses and latitude/longitude coordinates to CB/CBG boundaries
7	QMS-Centrus/GDT geocoding software	Used to convert street addresses into latitude and longitude coordinates
8	PNR clustering software	Convert collections of latitude/longitude coordinates into engineerable clusters of telephone customer locations
9	BCM PLUS data on terrain characteristics	Database that provides principal USGS soil type associated with CBGs
10	NECA USF data on exchange carriers and line counts	Used to develop list of study areas and line counts to determine nonrural carriers. These line counts used to determine line targets by study area.
11	Bellcore Special LERG Extract Data (SLED)	Collection of switching entity data on wire center CLLI codes, V&Hs and functional indicators extracted from complete Bellcore LERG.  Used to establish target wire center list and to determine inter-wire center distances. The SLEC is made available to all HM users under a blanket license secured from Bellcore.
12	NECA Tariff #4 data	Publicly available data on wire center V & H coordinates

## DATA SOURCES USED IN THE HATFIELD MODEL v5.0

13	FCC ARMIS data	Data reported by the Tier 1 LECs on line counts, traffic data, and embedded accounting data
14	USTA data	Data reported by the larger non-Tier 1 LECs on counts of business and residence lines
15	RUS data	Data reported by the smaller non-Tier 1 LECs on counts of business and residence lines
16	FCC 1995 USF Data Request	Data used to establish business and residence line targets for a collection of smaller LECs that do not file ARMIS
17	NECA Traffic Study Data	Data on DEMs by jurisdiction
18	Numerous other data reports	Examples include, NBI data on switch prices, New England Incremental cost study, AT&T Capacity Cost Study, etc.